

### Abstract of the Disclosure

The disclosure relates to zinc oxide-based sorbents, and processes for preparing and using them. The sorbents are preferably used to remove one or more reduced sulfur species from gas streams. The sorbents comprise an active zinc component, optionally in combination with one or more promoter components and/or one or more substantially inert components. The active zinc component is a two phase material, consisting essentially of a zinc oxide (ZnO) phase and a zinc aluminate ( $\text{ZnAl}_2\text{O}_4$ ) phase. Each of the two phases is characterized by a relatively small crystallite size of typically less than about 500 Angstroms. Preferably the sorbents are prepared by converting a precursor mixture, comprising a precipitated zinc oxide precursor and a precipitated aluminum oxide precursor, to the two-phase, active zinc oxide containing component.